

# A new taxon of small shearwater from the Indian Ocean

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The Aldabran population of small shearwater *Puffinus*, hitherto assigned to Audubon's Shearwater *P. lherminieri* (but see Shirihai *et al.* 1995, and discussion below), is one of the least-known tubenoses in the Indian Ocean as regards its taxonomy, biology and abundance (Diamond 1994, Stoddart 1984; Dr R. P. Prÿs-Jones pers. comm.), having been discovered only very recently by A. W. Diamond in 1967-68 (Diamond 1971). All populations of supposed Audubon's Shearwaters in the western Indian (and sometimes other) Ocean(s) had been included in *P. l. bailloni* (Bonaparte 1857, Godman 1907-10, Murphy 1927), until Jouanin (1970) placed all the forms with brown undertail-coverts under *P. l. nicolae* and those with white undertail-coverts from the Mascarene Islands (also the locality of Bonaparte's type specimen) under *bailloni*. The type specimen of *bailloni*, however, has apparently long been missing (see also discussion below).

During study in the Natural History Museum, Tring, in connection with the newly described *P. atrodorsalis* by P. R. Colston and HS (see Shirihai *et al.* 1995), we noted that the Aldabran small-shearwater population is in fact identical to that of the Mascarenes, including Réunion (*bailloni*), in general size, bill proportions and several aspects of plumage coloration and pattern. Moreover, in these respects the two differ rather strongly from all other populations in the western Indian Ocean (mainly Seychelles birds) and all other oceans, but differ from each other in hardly any way other than the colour of the undertail-coverts.

We therefore consider that this distinctive Aldabran population represents a separate taxon, for which we propose the name

## ***Puffinus lherminieri colstoni* subsp. nov.**

*Holotype*. ♂, Gionnet, Aldabra, 31 January 1968. Royal Society Expedition; A. W. Diamond coll. Specimen in Natural History Museum, Tring, No. 1968-43-87.

*Description of type*. Generally a uniform very dark blackish-brown dorsally, but feather tips of mantle, scapulars and median and lesser upperwing-coverts very indistinctly browner (each feather with concealed grey basal area, and exposed black subterminal area and slightly browner tip). This same colour on head extends well below eye and covers much of ear-coverts, and is also well demarcated from the pure white throat. The rest of the underparts are pure white, except for obvious large mottled patches on neck and chest sides (created by white tips and dark subterminal areas on feathers running down neck sides)

and a lateral extension of dark feathering from rump to 'thighs'. The dark undertail-coverts are formed by uniformly dark brown feathers (mainly the long ones) and mixed/partially brown feathers (mainly the small ones). Tail feathers uniform dark sooty-brown. The underwing-coverts are white, and rather broadly framed by a blackish-brown leading edge and mostly dusky-grey to blackish remiges; the basal inner webs of the greater primary coverts are brown (probably creating a mottled carpal region), and there is also some brownish colour on two central greater coverts and brown on some axillary feathers.

*Bare parts.* Bill proportionately long, but mainly deep and typically broad, with well-developed nasal tubes and maxillary unguis; generally black, with gape fleshy-coloured (from skin label). Legs mostly flesh-coloured with dark outer side, and with dark outer half and underside of feet (from skin label).

*Measurements of holotype (mm).* Wing 201; tail 77; bill (to skull) 35.7, (to feathering) 28.3; bill depth (at point below tubes) 7.5, (at top of unguis region) 7.5; tarsus 41.9.

*Etymology.* We have chosen to name this subspecies after Peter R. Colston, as a mark of our respect on his retirement from the Natural History Museum, Tring. We wish to emphasise our appreciation of his taxonomic knowledge and our gratitude for the invaluable help he has given both to us and to many others over many years.

*Relationships and recognition.* The form *colstoni* is very similar to *bailloni* (from the Mascarenes) in general size (wing, tail and bill lengths), and shares with the latter form the characteristic markedly robust, bulbous (almost *Pterodroma*-like) bill with well-developed nasal tubes and maxillary unguis (see Fig. 1); both also exhibit typically deep sooty blackish-brown upperparts and a rather well-defined bold dark subterminal area on the individual feathers of the pectoral patches (a dark tract of feathering running down the neck sides), these patches being more extensive than on populations of other regions. The two also have the longest middle toe (see table in Jouanin 1970), measuring 40–46 mm, against 36.5–42 mm in Seychelles area and Maldives (see also discussion below). They differ markedly from each other, however, in that *colstoni* has mainly brown undertail-coverts, these being diagnostically mainly white on *bailloni*, and also shows a greater penetration of the pectoral patches (the area of white on the central chest between the two patches measures 15–24 mm on *colstoni*, against 26–36 mm on *bailloni*). There are some subtle differences in wing and bill lengths, *colstoni* averaging marginally smaller than *bailloni* (Fig. 1; see also Appendix in Shirihai *et al.* 1995).

The form *colstoni* is markedly different from the Seychelles population (*nicolae*) of 'Audubon's' Shearwater in the following respects. The wing, tail and bill are rather noticeably longer and the bill structure markedly robust, with deeper/thicker base (including tubes) and unguis region, the maxillary unguis being much better developed than that of Seychelles birds—in fact, in this respect the two represent clear extremes. Pigmentation above is overall slightly sootier blackish (less brown), thus similar to *bailloni* (see above); there is a fairly clear tendency for the dark area below the eye to be more solid and more

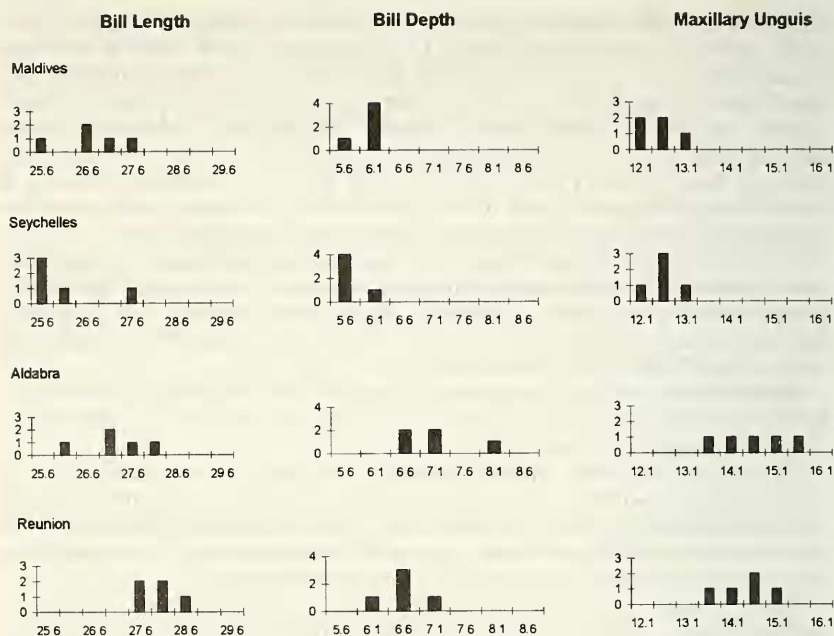


Figure 1. Measurements of four populations (for each,  $n=5$ ) of Audubon's Shearwater *Puffinus lherminieri*. Vertical axis shows number of birds; horizontal axis gives measurements expressed in 0.5-mm ranges (figures indicate lower point of range: e.g. 25.6=range 25.6–26.0 mm). Bill length measured from feathering; bill depth from below tubes. In this study, Maldives and Seychelles populations are regarded as *P. l. nicolae* (showing similarity in bill length and depth and in development of maxillary unguis), with Aldabra and Réunion populations treated as *P. l. colstoni* and *P. l. bailloni* respectively (showing deeper bill and clearly better-developed maxillary unguis). Material from Natural History Museum, Tring, and specimens loaned to same.

sharply demarcated from the white throat, and this dark area is generally more extensive (from bottom of eye to lower border of dark=6–8 mm on *colstoni*, against 4–5 mm on Seychelles population); the pectoral patches are distinctly larger, leaving a smaller white area in between compared with Seychelles birds (15–24 mm on *colstoni*, against 31–38 mm in Seychelles)—in this respect the two again represent the two extremes, and (although based on small samples) it appears that there is no overlap; in *colstoni* there is also a slight tendency for the undertail-coverts to contain a smaller number of feathers with complete brown colour, having slightly more feathers with mixed whitish and brown (on the corresponding feathers of each population, the white area is generally larger on *colstoni*), thus creating a slightly less clear pattern than the generally more solid dark undertail-coverts that are usually an obvious character of Seychelles birds.

The Maldives population represents a somewhat intermediate form between *colstoni* and the Seychelles, although in most respects it clearly

approaches the latter form and is thereby separated from the former. Aldabran *colstoni* averages only marginally larger than Maldives birds, but the latter's bill (proportions/thickness) is weak and in fact almost identical to that of Seychelles birds (see Fig. 1) and therefore shows a difference corresponding to that between *colstoni* and Seychelles birds described above; *colstoni* generally is marginally blacker/darker (less brown) above than Maldives birds and tends to have a slightly sharper demarcation between the blackish-brown area below the eye and the whitish throat, while the pectoral patches are distinctly larger and darker (exhibiting almost the same difference as found between *colstoni* and Seychelles populations: white divide between patches = 15–24 mm in *colstoni*, against 19–35 mm in Maldives); the undertail-coverts, however, are similar in pattern to those of Maldives birds.

*Specimens examined (at Natural History Museum, Tring)*. *Puffinus lherminieri*: *colstoni* (Aldabra, 5); *nicolae* (Seychelles region, 9, incl. 2 on loan from Muséum de Paris; Maldives, 5); *bailloni* (Réunion, 5, incl. 3 on loan from Muséum de Paris).

### Discussion

Our investigations so far (as presented above) have demonstrated that the small-shearwater populations that have colonised the Indian Ocean cannot be determined (sub)specifically primarily by the coloration of the undertail-coverts (generally white in *bailloni* from the Mascarenes, and largely brown in the remaining populations). Other, morphological differences, no less distinct and probably of even greater importance, are also involved, such as the bill structure, length of middle toe, upperpart coloration, development of pectoral patch and overall size and proportions (Table 1). In all the latter parameters (i.e. excluding undertail-covert coloration) the Aldabran population (*colstoni*) and that of the Mascarenes, including Réunion, are virtually identical in sharing the overall larger size (including the longer toes), predominantly blacker upperparts and characteristically more robust bill and better-developed pectoral patches than all other breeding populations examined (in this study, from Seychelles area and Maldives). This in fact contradicts previous assumed criteria as used by e.g. Jouanin (1970), who placed all birds with white undertail-coverts in one form, *bailloni*, and those with brown undertail-coverts, including the Aldabran birds, under *nicolae*. The Aldabran type-series has probably never been examined properly; Jouanin, for example, expressed his thanks to A. W. Diamond for informing him about the Aldabran specimens, but it appears that he did not have the opportunity to examine them directly.

The material available to us is rather limited and does not allow a complete review of the taxonomic relationships of the small shearwaters in the Indian Ocean; we have been unable to look at any specimens from the Chagos archipelago and the Amirantes, though a small sample of the latter population was, in any case, regarded as inseparable from Seychelles birds by Jouanin (1970). Nevertheless, the relatively small sample size we have been able to examine (see above: good material from the Seychelles complex and the Maldives population, as well as *bailloni* of Réunion and *colstoni* from Aldabra) was sufficient to confirm that *colstoni* is similar to

TABLE 1  
Forms of *Puffinus lherminieri* in the Indian Ocean and their comparative features

	<i>bailloni</i> (Réunion- Mascarenes)	<i>colstoni</i> (Aldabra)	<i>nicolae</i> (Seychelles)	<i>nicolae</i> (Maldives)
General size (based mainly on wing)	large	medium to large	small	medium
Bill structure, maxillary unguis and nasal tube	longish but very robust, with well-developed and deep unguis and tube	much as <i>bailloni</i>	narrower/shorter, with relatively poorly developed unguis and tube	slender, with moderately developed unguis, generally approaching Seychelles form
Upperpart colour	blackish-brown	as <i>bailloni</i>	generally brown	approaching Seychelles form or slightly darker
Undertail- coverts	generally white, with brown feathers on sides	brown with relatively good number of mixed brown and white short coverts	generally brown	predominantly brown (with small amount of white on small coverts)
Pectoral patches	large	very large	small	small to medium
Middle toe	long(est)	long	small	small to medium

Mascarene birds in nearly all morphological aspects (but with mainly brown instead of mainly white undertail-coverts) and is thereby relatively distinct from all other populations in the Indian Ocean, i.e. from all those in the Seychelles and northeastwards from there. In fact, judging from the accepted validity (based on morphological differences) of other subspecies in closely related species, such as the relationships between the recognised forms of Little Shearwater *P. assimilis* in the southern oceans (*kernelensis*, *haurakiensis* and *elegans*) or between the Australasian ones (*tunnexi* and *assimilis*), as well as between these two groups, *colstoni* is by the same parameters at least as distinct or even more so from other populations of Audubon's.

The colonisation of the western Indian Ocean by the various forms of small shearwater is apparently more widespread than is generally realised. This probably applies equally to *colstoni*, which presumably also breeds slightly to the east on Cosmoledo and Astove (Diamond 1994, Stoddart 1984), and other forms are continuing to be found, e.g. the race *P. l. temptator* (brownish above and on underwing-coverts) from the Comoros (Louette & Herremans 1985). Even with some

material lacking, however, that which is available is adequate to demonstrate the following affinities in relation to geographical factors:

Both *bailloni* (Mascarenes) and *colstoni* breed approximately around 10–20°S on elevated limestone islands, and these two have the darkest upperparts, the largest size, the longest middle toe, the most robust bill and the most strongly developed pectoral patches, though they differ from each other in undertail-covert coloration.

The *nicolae* population which has colonised the Seychelles complex (known to nest in the Amirantes group and east to Denis, Aride, Cousin and Mahé) breeds between 10°S and the equator mainly on the low coral and granite islands, and has a slightly smaller size and shorter middle toe, browner upperparts, narrower/smaller bill and much smaller pectoral patches. The population from the Maldives, and apparently also from Chagos archipelago (and thus breeding on both sides of the equator), would seem from our present knowledge to be best retained under *nicolae*, although it is marginally larger and darker than birds from the Seychelles.

The development of distinct morphological characters according to geographical (latitudinal and longitudinal) location of the two main population groups in the western Indian Ocean, i.e. *nicolae* on the one hand and *bailloni* and *colstoni* on the other, appears rather clear in this study. Moreover, it would seem likely that there is more involved in this concept with regard to the development of a stronger bill (probably related to nutrition) and larger size (including longer toes, possibly an adaptation related to burrow-excavation in the harder terrain of these islands) in the more southerly population, where the marine habitat appears to differ (in terms of geomorphology and hydrography, and the consequent nature and sub-surface dispersion of marine organisms) from that farther north, in the Seychelles and Maldives.

In summary, the above shows that the Aldabran and Mascarene forms of small shearwater are very closely related to each other, and together differ very strongly from all other forms in the Indian Ocean; they may even represent a distinct species with two subspecies. The position of *bailloni* needs to be clarified, since the type specimen is missing and since Bonaparte's (1857) original very brief description ("*Minimus: nigricans; subtus abrupte a rostro candidus*") is totally inadequate and could apply to many small-shearwater forms; in addition, the name *bailloni* has been used by several authors to refer to other forms (e.g. by Godman 1907–10 for birds with close affinities to Little Shearwater of the east-central Atlantic), resulting in a certain confusion.

With regard to the proposal to give specific rank to the populations of small shearwaters breeding in the Indian Ocean (see above and also Shirihai *et al.* 1995), if such a split is tenable and *bailloni* is shown to be an acceptable name, then the Mascarene and Aldabran populations would become *P. bailloni* with subspecies *P. b. bailloni* and *P. b. colstoni*, with the other Indian Ocean populations (i.e. Seychelles area eastwards to the Maldives) united under *P. nicolae*. If, however, further investigation reveals the name *bailloni* to be inapplicable for describing any discrete population, then the former would become *P. colstoni* and its Mascarene population would require a new subspecific name.

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## The continuing presence of Macgregor's Bird of Paradise *Macgregoria pulchra* on Mount Albert Edward, Papua New Guinea

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Macgregor's Bird of Paradise *Macgregoria pulchra* is a little-known species in a monotypic genus endemic to the highest areas of the central ranges of New Guinea. It occurs in the Snow and Star Mountains of west and central New Guinea, and in the mountains of the southeast (Beehler *et al.* 1986, Coates 1990). It is unknown between these two areas, despite much apparently suitable habitat. The species is large and unwary and so is often hunted. Collar *et al.* (1994) added it to the Red List as a globally threatened species, on the basis of small population size, fragmentation of range and presumed declines caused by hunting.

The southeastern population lives entirely within Papua New Guinea, with records from a 70 km strip of the central cordillera between Mount Albert Edward (Wharton Range) and Mount Victoria